WHAT IS CLAIMED IS:

5   1.   An apparatus for transmitting data on a fiber channel, the apparatus comprising:

an input that receives a digital signal to be transmitted;

a plurality of programmable modulators each configured to accept a portion of
10   the digital signal to be transmitted, and to modulate the portion of the digital signal accepted;

a plurality of mixers, each mixer coupled to the output of one of the programmable modulators to accept a modulated signal and mix it with a mixer frequency;

a plurality of bandpass filters, that filter the output of the mixers; and

a summation unit that combines the output of the mixers into a single signal.
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        2.   An apparatus as in claim 1 wherein the input that receives a digital signal to be transmitted comprises a Gigabit Media Independent Interface (GMII).

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        3.   An apparatus as in claim 1 wherein the input that receives a digital signal to be transmitted further comprises a control input that controls the number of bits of the digital signal to be transmitted which are provided to each modulator.

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        4.   An apparatus as in claim 1 wherein each programmable modulator further comprises a control input that controls the type of modulation that is applied to the portion of the digital signal that is accepted by each modulation.

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        5.   An apparatus as in claim 4 wherein the type of modulation selected consists essentially of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and quadrature amplitude modulation (QAM).

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6.   An apparatus as in claim 1 wherein the mixer frequency that is provided to the mixer is a programmable frequency.

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7.   An apparatus as in claim 1 wherein each bandpass filter has a programmable bandpass.

10   8.   An apparatus as in claim 1 wherein the apparatus is integrated within a single integrated circuit.

9.   An apparatus as in claim 8 wherein the single integrated circuit is a

15   complementary Metal Oxide Semiconductor (CMOS) integrated circuit.

10.   An apparatus for receiving data from a fiber channel the apparatus comprising:

20   an input that receives a wide band signal;

             a plurality of mixers that accept the wideband signal and mix it with a mixer frequency;

             a plurality of low pass filters that filter the outputs of the mixers;

25   a plurality of programmable demodulators each accepting the output of one of the mixers and demodulating said mixer output thereby providing a demodulated digital output; and

             a combiner circuit for combining the demodulated digital outputs from the plurality of programmable demodulators into at least one digital data stream.

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11.   An apparatus as in claim 10 wherein the mixer frequency is a programmable frequency.

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12.   An apparatus as in claim 10 wherein the plurality of low pass filters have programmable bandwith.

13.   An apparatus as in claim 10 wherein the programmable demodulators further comprise a control input that controls the type of demodulation applied to the signal accepted from the mixer.

14.   An apparatus as in claim 13 wherein the type of modulation selected consists essentially of BPSK, QPSK, and QAM.

15.   An apparatus as in claim 10 wherein the combiner circuit comprises a XGMII.

16.   A method for transmitting data on a fiber optic channel, the method comprising:

    providing a test signal to a fiber optic channel;

    receiving a characterization of the channel defined by the channel response to the test signal;

    programming a multicarrier modulator corresponding to the characterization of the channel.

17.   A method as in claim 16 wherein providing a test signal to a fiber optic channel further comprises providing an intensity modulated light source wherein the intensity changes according to a frequency sweep signal, but the maximum and minimum intensity does not change.

18.   A method as in claim 16 wherein programming a multicarrier modulator further comprises selecting a type of modulation for a plurality of modulators, wherein each modulator corresponds to a modulation of one of a multicarrier signals.

19.   A method as in claim 16 wherein programming a multicarrier modulator further comprises providing a plurality of selected mixer frequencies to a plurality of mixers, wherein the mixers determine the carrier frequencies for the multicarrier modulator.

20.   A method as in claim 19 further comprising programming a bandpass filter with a center frequency corresponding to the mixer frequency of the mixer which provides a signal to the bandpass filter.

21.   A method as in claim 20 further comprising selecting the bandwidth of a plurality of bandpass filter depending on the modulation of the signal being filtered by each bandpass filter.

22.   An apparatus as in claim 1 further comprising a plurality of convolutional coders disposed between the input and at least one of the plurality of programmable modulators and accepting a portion of the signal to be transmitted from the input and performing a convolutional coding on the accepted signal thereby providing a convolutionally coded output to the at least at least one of the plurality of programmable modulators.

23.   An apparatus as in claim 10 further comprising:

at least one demodulator providing soft decisions as an output;

at least one trellis decoder that accepts soft decisions from the at least one demodulator and provides a trellis decoding of the soft outputs and provides a hard decision to the combiner output.

24.   An apparatus for transmitting data on a fiber channel the apparatus comprising:

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an input that receives a digital signal to be transmitted;

a convolutional coder disposed between the input and at least one symbol encoder;

a plurality of symbol encoders that accept a portion of the signal received by the input,

10   and encode the input into a symbol (S) and a complex conjugate of the symbol (S*);

a 32-inverse fast Fourier Transformer (32-IFFT) that receives S and S* signals and

provides a digital output signals;

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a plurality of D/A converters for accepting the digital outputs from the 32-IFFT and

for converting the accepted digital value to an analog value; and

an analog multiplexer that samples the analog outputs from the plurality of digital to

analog converters and combines them into an interleaved signal having successive values

20   representative of the output of the plurality of digital to analog converters.

25.   An apparatus for receiving data on a fiber channel the apparatus comprising:

25   an input that accepts an interleaved signal comprising a plurality of discrete successive

values;

a plurality of sample and hold circuits that accept the interleaved signal an extract a

sample comprising a discrete value;

30   a plurality of analog to digital converters that convert the discrete values form the

plurality of sample and hold circuits to a plurality of digital values;

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a 32 Inverse Fourier Transform circuit that accepts said plurality of values from the

5   plurality of analog to digital converters and converts said values into symbols (S) and

complex conjugates of the symbols (S*);

A plurality of trellis decoders that accept said symbols (S) and said complex

conjugates of the symbols (S*) and produced an uncoded output; and

10   an interface which accepts the outputs of said plurality of trellis decoders and

combines them into a digital signal.

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